

Serial No. 09/507,079

Group Art Unit: 1764

REMARKS

Claim 1 is amended. The amendment is supported by the application as originally filed, for example, page 15 lines 3-18. No new matter is added by the amendment.

Claims 1, 7 and 9 are rejected under 35 U.S.C. §103(a) as being unpatentable over Trocciola et al. (US 5,330,727) in view of DeRycker et al. (US 2,887,365). Applicants traverse the rejection to the extent that it can be maintained.

Applicants claim a CO removing device that provides improved selectivity in removal of CO, i.e. less undesirable side reaction, and a simpler structure for the device than prior art devices. Hydrogen gas containing CO is passed through a selective oxidative catalyst bed (SOCB) at a temperature range of about 140-190°C. A temperature lower than this range becomes inefficient to remove CO, and a temperature higher than this range tends to promote side reactions such as combustion of hydrogen (Background of the Invention). However, it is difficult to control the temperature of the SOCB across the width of the bed. The temperature of the portion of the bed adjacent the walls of a vessel (peripheral part) containing the bed tends to be relatively low while the bed toward the middle of the vessel (central part) tends to be relatively high. Applicants discovered that by cooling an upstream portion of the SOCB so that the central part of the bed is in the desired temperature range, then blending gas from the peripheral part and central part of the bed before passing the gas into a downstream portion of the bed that is not cooled, a high selectivity of CO removal is achieved. The claimed structure provides a simple means to regulate the temperature of the bed and gas from an upstream to a downstream part of the SOCB and to avoid the undesirable side reactions.

Trocciola et al. (US '727) disclose a device for removing CO from a gas stream by passing the gas through two catalyst beds connected in series and controlling the temperature of catalyst beds by cooling coils embedded in each bed. US '727 fails to disclose a double-walled cylinder with an annular clearance between a gas passing tube containing the SOCB wherein the cylinder is located upstream of a gas blending unit. Further, Applicants submit that contrary to the conclusion of the Office Action, US '727 fails to disclose a blending unit projecting inward from the inner surface of the gas passing tube so as to partially obstruct the gas passing tube.

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The elements of US '727 identified in the Office Action as a gas blending unit are cooling coils embedded in the SOBC. As clearly shown in figure 1, gas is able to pass around or through the central part of the coil without a blending function being performed. Further, there is no purpose achieved even if a small amount of blending occurs. Gas passes through a first stage of catalytic treatment at one temperature and then, after passing through a heat exchanger, through a second stage at a different temperature. If there is any blending occurring, a point that Applicants do not concede, it is irrelevant as far as temperature control is concerned. Temperature control by the device disclosed in US '727 is achieved by cooling coils and a heat exchanger and not by modulating the flow of gas within the SOCB.

De Rycker et al. (US '365) disclose a catalytic reactor wherein a catalytic reaction cartridge 3 is contained within a tube 1 with an annular space therebetween. Gas to be treated is introduced to the reactor at an opening 5 at the base of the tube and passes through the annular space to the top of the cartridge. The gas then passes through a tubular assembly to the base of the cartridge wherein it is directed up through a catalyst bed to a discharge port. Note that the annular space is an integral feature of the device of US '365 that enables pre-heating of incoming gas prior to entering the catalyst bed (column 3 line 72).

Applicants respectfully submit that there is no motivation to combine US '757 with US '365 as done in the Office Action, and if combined, would defeat the function of the US '757 device and not result in Applicants' claimed invention.

US '757 discloses two catalyst beds connected in series having cooling coils embedded in each bed. The two catalyst beds are regulated to operate at different temperatures. US '365 discloses a tube entirely enclosing a catalyst bed with an annular space therebetween. There is no teaching from US '365 to selectively enclose only a portion of a catalyst bed as claimed. Combining the structure of US '365 with the structure of US '757 results in a tube enclosing both of the catalyst beds disclosed in US '757. Such a combined structure defeats the object of US '757 by regulating both catalyst chambers at the same temperature. Note that the Office Action at the top of page 4 acknowledges that De Rycker et al offers the advantage of providing the reactor with an even temperature throughout the catalyst bed. Further, the combined structure does not satisfy the limitation of claim 1 that the double walled cylinder is being disposed upstream from

a gas blending unit. There is no suggestion of this feature in either reference.

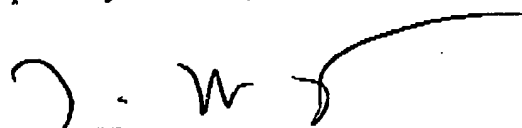
US '365 only discloses gas passing through the annular space between the tube 1 and reaction chamber 4. There is no teaching in US '365 that cooling water can be passed through the annular space as an alternative to gas. Applicants submit that it is impossible to pass cooling water through the annular space without contaminating the catalytic reactor of US '365 and defeating its function. US '365 does not suggest a cooling function and so no purpose would be served by passing cooling water through the space. Accordingly, the combination of US '757 and US '365 provides no teaching that cooling water could -- or should be -- passed through the annular space formed by combining the structures each discloses.

Applicants respectfully submit that claim 1 is allowable as there is no motivation to combine US '757 and US '365 and if combined, fail to teach or suggest the invention of claim 1. The remaining claims all depend directly or indirectly from claim 1 and are likewise allowable. Applicants request that the rejection be withdrawn.

In view of the above amendments and remarks, Applicants respectfully request a Notice of Allowance. If the Examiner believes a telephone conference would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at 612.336.4755.

Respectfully submitted,

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Date


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